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LOW-COST HIGH-QUALITY ν BEAM

A. D. Krisch
University of Michigan

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We are proposing that rather than using a large block of steel to stop the μ's in a ν beam another approach should be used. The essential points of this technique are:

(1) Use a pair of quads (Q_1, Q_2), a collimator, and a plug to stop all pions except in the range 30± 8 GeV/c (or 60±15 GeV/c).

(2) Use a pair of quads (Q_3, Q_4) to focus these π's so that they remain in a 1-ft by 1-ft pipe. (38 GeV/c are parallel, 30 GeV/c focus at π-stop, 22 GeV/c focus at 1/2 way to π-stop)

(3) Use two bending magnets (#1 and #2) to put a 3-ft transverse displacement in the beam. This sets the polarity of the π beam. It also removes any 150 GeV/c μ's made before the high-momentum π's stop in the plug.

(4) The π's decay in a 600-m pipe which is very narrow (2 ft by 1 ft).

(5) The μ's from these decays are either:

a) stopped in the 600 m of earth surrounding the pipe

b) deflected past the detector by the small-aperture bending magnet which has a larger aperture than the decay pipe.

This has somewhat less intensity than a "steel-block" beam, but has the following advantages:

(1) low cost (less than \$2 million).

(2) monochromatic.

(3) high quality--the transverse position of the origin of the ν is known to ±1 ft. Therefore, the angle of the ν is known to ±0.001 rad at worst.

(4) more flexibility--easier to change if unexpected problems occur.

(5) the smaller transverse position of the ν origin allows a smaller transverse area of the detector. This gives more interactions for the same detector weight.

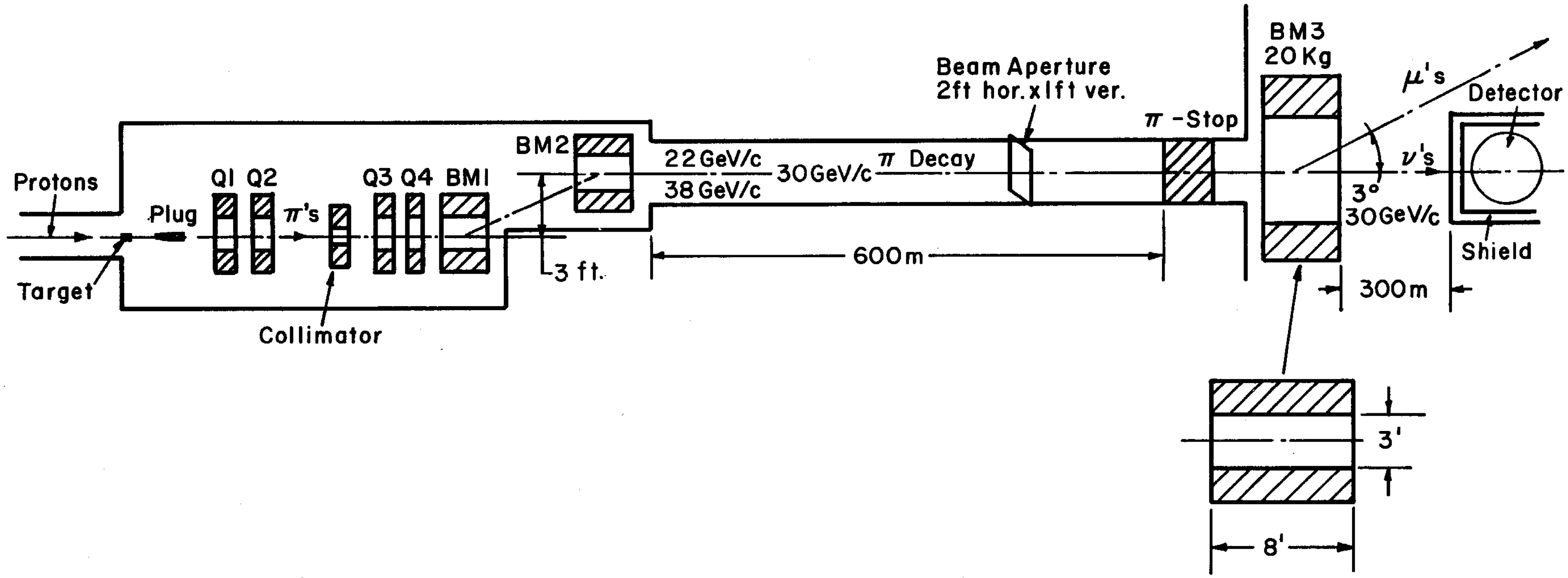

Fig. 1. Low-cost high quality neutrino beam: pions of one sign at 30 $\pm$ 8 Gev/c decay in a small buried pipe. The central energy can be varied.

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